



Europäisches Patentamt
European Patent Office
Office européen des brevets

(19)

(11) Publication number:

0 336 578
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 89302553.6

(51) Int. Cl.4: A61F 13/16

(22) Date of filing: 15.03.89

(33) Priority: 31.03.88 US 175559
04.01.89 US 293606

(43) Date of publication of application:
11.10.89 Bulletin 89/41

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: THE PROCTER & GAMBLE
COMPANY
One Procter & Gamble Plaza
Cincinnati Ohio 45202(US)

(72) Inventor: Osborn III, Thomas Ward
400 Deanview Drive
Cincinnati Ohio 45224(US)

(74) Representative: Gibson, Tony Nicholas et al
Procter & Gamble (NTC) Limited Whitley
Road
Longbenton Newcastle upon Tyne NE12
9TS(GB)

(54) Thin, flexible sanitary napkin.

(55) In accordance with the present invention, a sanitary napkin having a body surface and a garment surface and being comprised of an absorbent means underlaid by a liquid barrier means, wherein the sanitary napkin is relatively highly flexible and has a capacity great enough to handle medium to high menstrual flows, is provided. In a preferred embodiment, the sanitary napkin comprises, from the body surface down, an apertured formed film topsheet, an apertured nonwoven wipe acquisition sheet, a wet-laid tissue, a superabsorbent core, and a barrier sheet. Preferably, the central width of the absorbents is at least about 6.5 centimeters and the caliper of the napkin as a whole is less than about 2.6 millimeters. In a preferred embodiment, the napkin has laterally extending flaps which drape over the edges of the wearer's panties in the crotch and are attachable to the garment side of the wearer's panties.

EP 0 336 578 A1

THIN, FLEXIBLE SANITARY NAPKIN

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to female sanitary napkins. Particularly, the present invention concerns thin, flexible sanitary napkins offering enhanced fit and comfort through a construction which promotes a continuously self-conforming anatomical cooperation of the sanitary napkin to the wearer to yield a highly effective absorbent device.

2. Background Art

All manner and variety of absorbent articles configured for the absorption of body fluids such as menses, urine and feces are, of course, well known. With respect to feminine protection devices, the art has offered two basic types; sanitary napkins have been developed for external wear about the pudendal region while tampons have been developed for internal wear within the vaginal cavity for interruption of menstrual flow therefrom. Such tampon devices are disclosed in U.S. Patent 4,412,833, entitled "Tampon Applicator", which patent issued to Weigner et al. on November 1, 1983, and U.S. Patent 4,413,986, entitled "Tampon Assembly With Means For Sterile Insertion", which patent issued to Jacobs on November 8, 1983.

Hybrid devices which attempt to merge the structural features of the sanitary napkins and the tampons into a single device have also been proposed. Such hybrid devices are disclosed in U.S. Patent 2,092,346, entitled "Catamenial Pad", which patent issued to Arone on September 7, 1937, and U.S. Patent 3,905,372, entitled "Feminine Hygiene Protective Shield", which patent issued to Denninger on September 16, 1975. Other less intrusive hybrid devices are known as labial or interlabial sanitary napkins and are characterized by having a portion which at least partially resides within the wearer's vestibule and a portion which at least partially resides external of the wearer's vestibule. Such devices are disclosed in U.S. Patent 2,662,527, entitled "Sanitary Pad", which patent issued to Jacks on December 15, 1953, and U.S. Patent 4,631,062, entitled "Labial Sanitary Pad", which patent issued to Lassen et al. on December 23, 1986.

With respect to sanitary napkins, at least two general classes pertinent to the present invention exist. One such class is for the absorption of me-

dium to high menstrual flows. These sanitary napkins offer a fairly high absorptive capacity. Absorptive capacity is commonly achieved by providing the napkin with a fairly thick and bulky absorbent member, commonly fluff pulp. Sanitary napkins of this class are disclosed in U.S. Patent 3,294,091, entitled "Sanitary Napkin", which patent issued to Morse on December 27, 1966, U.S. Patent 4,654,040, entitled "Smooth-Edged Contoured Sanitary Napkin", which patent issued to Luceri on March 31, 1987, and U.S. Patent 4,687,478, entitled "Sanitary Napkin With Flaps", which patent issued to Van Tilburg on August 18, 1987. Such sanitary napkins theoretically have a high absorptive capacity, however, when the sanitary napkin is worn and subjected to the compressive forces of the wearer's thighs and pudendal region, the fluff pulp core simply compacts or bunches into an arbitrary, but generally rope-like shape. Such napkins commonly shift from their original placement so that after only a short wearing time, the napkin might only partially, if at all, be beneath the wearer's vaginal orifice or vestibule. Thus, in use, these sanitary napkins sometimes offer very little absorption. Further, the rolling and twisting of these napkins may create soiling on the wearer's panties and skin surfaces. In addition, the bulkiness of these napkins causes a high degree of wearing awareness and may make them quite obtrusive when worn with tight fitting slacks, body suits or bathing suits.

A second class of sanitary napkins are intended for light or low menstrual flows and are commonly referred to as panty liners or panty shields. Sanitary napkins of this type are disclosed in U.S. Patent 4,681,578, entitled "Pantiliner With Ventilation Areas", which patent issued to Anderson and Brandt on July 21, 1987. Sanitary napkins of this class, as a group, are thinner, somewhat more flexible and generally more comfortable than those of the first class, however, they lack the absorptive capacity of the napkins of the first class.

Therefore, there exists a real consumer need for a sanitary napkin which is thin and flexible, thereby offering enhanced fit and comfort, yet having a fluid capacity great enough for use with medium to high menstrual flows thereby allaying consumer fears of leakage and staining.

Therefore, it is an object of the present invention to provide a sanitary napkin which is thin and flexible and which is absorbent enough to absorb and contain medium to high menstrual flows.

It is an additional object of the present invention to provide a sanitary napkin which will closely conform to the various anatomical shapes of the female urogenital and buttocks region.

It is an additional object of the present invention to provide a sanitary napkin which offers enhanced fit and comfort and a low degree of wearing awareness.

It is an additional object of the present invention to provide a thin and flexible sanitary napkin having laterally extending flaps configured to drape over the side edges of the wearer's panties in the crotch portion thus being disposed between the side edges of the wearer's panties in the crotch portion and the wearer's thighs.

It is an additional object of the present invention to provide the laterally extending flaps with an attachment means on their garment facing surface so that the flaps can wrap around the side edges of the wearer's panties in the crotch portion and be attached to the garment facing side of the wearer's panties in order to provide protection from soiling and so as to keep the napkin properly positioned in the wearer's panties.

SUMMARY OF THE INVENTION

According to the invention, there is provided a sanitary napkin having a body surface and a garment surface, comprising an absorbent means having a first major surface and a second major surface; and a liquid impermeable barrier means forming said garment surface and disposed adjacent said second major surface of said absorbent means, wherein said sanitary napkin has a caliper of less than 5.0 millimeters, a flexure-resistance of less than 400 grams, a test capacity of at least 8.0 grams, and a total capacity of at least 14.0 grams.

In a preferred embodiment, the sanitary napkin comprises, from the body surface down, an apertured formed film topsheet, an apertured nonwoven wipe acquisition sheet, a wet-laid tissue, a superabsorbent core, and a barrier sheet. Preferably, the central width of the absorbents is at least about 7.0 centimeters and the caliper of the napkin as a whole is less than about 2.5 millimeters. In a preferred embodiment, the napkin has laterally extending flaps which drape over the edges of the wearer's panties in the crotch and are attachable to the garment side of the wearer's panties.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top plan view of a preferred sanitary napkin embodiment of the present invention with portions being torn away to show underlying structure.

Figure 2 is a lateral cross-sectional view of the preferred sanitary napkin embodiment shown in Figure 1 taken along line 2-2 of Figure 1.

Figure 3 is a top plan view of a preferred topsheet and wipe acquisition sheet laminate with portions of the topsheet being torn away to show underlying structure.

Figure 4 is a top plan view of an alternatively preferred sanitary napkin embodiment of the present invention with portions being torn away to show underlying structure.

Figure 5 is a top plan view of another alternatively preferred sanitary napkin embodiment of the present invention with portions being torn away to show underlying structure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

20

The present invention relates to female sanitary napkins and in particular to sanitary napkins which are thin and flexible and offer enhanced fit, comfort, and containment.

As used herein, the term "sanitary napkin" refers to an article which is worn by females adjacent to the pudendal region and which is intended to absorb and contain the various exudates which are discharged from the body (e.g., blood, menses and urine) and which is intended to be discarded after a single use (i.e., it is not intended to be laundered or otherwise restored or reused). Interlabial devices which reside partially within and partially external of the wearer's vestibule are also within the scope of this invention. As used herein, the term "pudendal" refers to the externally visible female genitalia and is limited to the labia majora, the labia minora, the clitoris, and the vestibule.

A preferred embodiment of a sanitary napkin 10 of the present invention is shown in Figures 1 and 2. As can be seen in Figures 1 and 2, a preferred sanitary napkin 10 basically comprises an absorbent means 13 and a liquid impermeable barrier means 16. The absorbent means 13 may be any means which is generally compressible, conformable, non-irritating to the wearer's skin and capable of absorbing and containing body exudates such as menses, blood and urine. Preferably, the absorbent means 13 maintains integrity when wetted, in use. The absorbent means 13 has a first major surface 19 and a second major surface 22. The barrier means 16 is adjacent the second major surface 22 of the absorbent means 13. The barrier means 16 may be any means which is flexible and liquid impervious and which prevents the exudates absorbed and contained in the absorbent means 13 from wetting articles which contact the sanitary

napkin 10 such as panties.

In the preferred embodiment shown in Figures 1 and 2, the absorbent means 13 is comprised of a liquid permeable topsheet 25, a liquid permeable wipe acquisition sheet 28, a wet-laid tissue sheet 31 and an absorbent core 34. In the preferred embodiment shown in Figures 1 and 2, the barrier means 16 is a barrier sheet. The absorbent core 34 is comprised of hydrogel-forming material 37 disposed between two air-laid tissue sheets 40 and 43. The sanitary napkin 10 has side edges 11 and end edges 12 which together form the periphery 15 of the sanitary napkin 10. The sanitary napkin 10 has a body surface 26 which is generally defined by the topsheet 25 and a garment surface 17 which is generally defined by the barrier sheet 16.

Looking at some of the elements of the sanitary napkin 10 more specifically, the absorbent core 34 may be any means which is generally compressible, conformable, non-irritating to the wearer's skin and capable of absorbing and containing body exudates. The absorbent core 34 has a first major surface 46, a second major surface 49, a pair of end edges 52 and a pair of side edges 55. The absorbent core 34 may be manufactured in a wide variety of sizes and shapes (e.g., rectangular, hourglass, etc.). A preferred shape of the absorbent core 34 is the dogbone shape shown in Figure 1. This preferred absorbent core 34 is 22.0 centimeters long (longitudinal dimension along the longitudinal centerline 58), 7.0 centimeters wide across its midportion (lateral dimension along the lateral centerline 61) and 8.0 centimeters wide across its widest portion (lateral dimension). The absorbent core 34 is symmetrically configured for ease of manufacture and so that no conscious effort is required by the wearer to properly place the napkin 10 in the direction it should be worn. The midportion is configured to basically conform to the wearer's thighs and to the thinner crotch portion of the wearer's panties so as to prevent excessive bunching. The size of the absorbent core 34 may be varied to accommodate wearers ranging in size and also ranging in the expected amount of exudate fluid volume. The absorbent core 34 may be attached over the core's first or second major surfaces 46 and 49, respectively, to adjacent members such as the topsheet 25 and barrier sheet 16 by any of the means well known in the art, such as by spray-gluing or lines or spots of adhesive. Such attachment facilitates integrity and recoverability of the absorbent materials in use so as to maintain an optimum degree of absorbency. Preferably, the absorbent core 34 has a wet-tensile strength in the cross-direction of at least about 100.0 grams per centimeter. Wet tensile strength is determinable by ASTM Standard D 829-49.

The absorbent core 34 may be manufactured

from a wide variety of liquid absorbent materials commonly used in disposable sanitary napkins, diapers, and other absorbent articles. Examples of suitable absorbent materials include comminuted wood pulp which is generally referred to as airfelt, creped cellulose wadding, absorbent foams, absorbent sponges, synthetic staple fibers, polymeric fibers, hydrogel-forming polymer gelling agents, or any equivalent materials or combinations of materials. A particularly preferred absorbent material are polymeric gelling agents. Polymeric gelling agents are those materials which, upon contact with fluids (i.e., liquids) such as water or body fluids, imbibe such fluids and thereby form hydrogels. In this manner, fluid discharged into the absorbent core 34 can be acquired and held by the polymeric gelling agent, thereby providing the articles herein with enhanced absorbent capacity and/or improved fluid retention performance.

The polymeric gelling agent which is employed in the absorbent core 34 will generally comprise particles of a substantially water-insoluble, slightly cross-linked, partially neutralized, hydrogel-forming polymer material. Such polymer materials can be prepared from polymerizable, unsaturated, acid-containing monomers. Suitable unsaturated acidic monomers for use in preparing the polymeric gelling agents used in this invention include those listed in U.S. Patent 4,654,039, entitled "Hydrogel-Forming Polymer Compositions For Use In Absorbent Structures", which issued to Brandt, Goldman and Inglin on March 31, 1987.

Preferred monomers include acrylic acid, methacrylic acid, and 2-acrylamido-2-methyl propane sulfonic acid. Acrylic acid itself is especially preferred for preparation of the polymeric gelling agent material.

In the hydrogel-forming polymeric gelling agent the polymeric component formed from unsaturated, acid-containing monomers may be grafted onto other types of polymer moieties such as starch or cellulose. Polyacrylate grafted starch materials of this type are especially preferred for use herein.

Preferred polymer gelling agents which can be prepared from conventional types of monomers include hydrolyzed acrylonitrile grafted starch, polyacrylate grafted starch, polyacrylates, maleic anhydride-based copolymers and combinations thereof. Especially preferred are the polyacrylates and polyacrylate grafted starch.

Whatever the nature of the basic polymer components of the hydrogel-forming polymeric gelling agents used in the absorbent core 34 herein, such materials will in general be slightly cross-linked. Cross-linking serves to render the hydrogel-forming polymer gelling agents used in this invention substantially water-insoluble, and cross-linking thus in part determines the gel volume and extractable

polymer characteristics of the hydrogels formed from the polymeric gelling agents employed. Suitable cross-linking agents are well known in the art and include, for example, those described in greater detail in U.S. Patent 4,076,663, which patent issued to Masuda et al. on February 28, 1978.

Preferred cross-linking agents are the di- or polyesters of unsaturated mono- or polycarboxylic acids with polyols, the bisacrylamides and the di- or triallyl amines. Especially preferred cross-linking agents are N,N'-methylenebisacrylamide, trimethylol propane triacrylate and triallyl amine. The cross-linking agent can generally comprise from about 0.001 mole percent to 5.0 mole percent of the resulting hydrogel-forming polymer material. More preferably, the cross-linking agent will comprise from about 0.01 mole percent to 3.0 mole percent of the hydrogel-forming polymeric gelling agent used herein.

The slightly cross-linked, hydrogel-forming polymeric gelling agents which may be used in the articles of the present invention are generally employed in their partially neutralized form. For purposes of this invention, such materials are considered partially neutralized when at least 25.0 mole percent, and preferably at least 50.0 mole percent of monomers used to form the polymer are acid group-containing monomers which have been neutralized with a salt-forming cation. Suitable salt-forming cations include alkali metal, ammonium, substituted ammonium, and amines. This percentage of the total monomer utilized which are neutralized acid group-containing monomers is referred to herein as the "degree of neutralization."

The polymeric gelling agent materials used in the absorbent articles herein must have a relatively high capacity for imbibing fluids encountered in such articles. The absorbent capacity of these materials can be quantified by referencing the "gel volume" of the polymeric gelling agents which are to be selected for use in the present invention.

For purposes of this invention, gel volume can be defined in terms of the amount of synthetic urine absorbed by any given polymeric gelling agent and is specified as grams of synthetic urine per gram of polymeric gelling agent. Gel volume in synthetic urine can be determined by forming a suspension of 0.1-0.2 parts of dried polymeric gelling agent to be tested with 20 parts of synthetic urine. This suspension is maintained at ambient temperature under gentle stirring for a time sufficient, e.g., 1 hour, for swelling equilibrium to be attained. The gel volume of the polymeric gelling agent in grams of synthetic urine per gram of polymeric gelling agent is then calculated from the weight fraction of the polymeric gelling agent in the suspension and the ratio of the liquid volume excluded from the formed hydrogel to the total vol-

ume of the suspension.

The gel volume of the gelling agents used in the absorbent core 34 herein will generally be at least 20.0 grams of synthetic urine per gram of polymeric gelling agent. More preferably, the gel volume of the materials employed will range from 20.0 to 60.0, most preferably from 22.0 to 35.0 grams of synthetic urine per gram of polymeric gelling agent.

Within the webs which form the layers of the absorbent core 34, the particles of the polymeric gelling agent should be thoroughly dispersed but may or may not be uniformly distributed. In particular, there may be regions or zones of the core layers which have higher concentrations of gelling agent particles than do other regions or zones of the layers.

In a preferred embodiment, the sanitary napkin 10 of the present invention will have a hydrogel-forming polymeric gelling agent distributed throughout at least 17.0 square centimeters of the napkin, more preferably throughout at least 50.0 square centimeters of the napkin, and most preferably throughout at least 100.0 square centimeters of the napkin. Preferably, the hydrogel-forming polymeric gelling agent will be distributed in an amount of from 0.001 grams per square centimeter to 0.009 grams per square centimeter, more preferably of from 0.003 grams per square centimeter to 0.008 grams per square centimeter, and most preferably from 0.004 grams per square centimeter to 0.007 grams per square centimeter. Preferably, the absorbent core 34 will contain from 5.0% to 85.0% by weight of hydrogel-forming polymeric gelling agent, more preferably from 10.0% to 70.0%, and most preferably from 15.0% to 55.0%.

In the preferred embodiment shown in Figure 2, the absorbent core 34 is a laminate comprised of a layer of superabsorbent polymer material 37 disposed between two air-laid tissues 40 and 43. A suitable laminate is the superabsorbent laminate WATER-LOCK L-535 available from the Grain Processing Corporation of Muscatine, Iowa (WATER-LOCK registered TM by Grain Processing Corporation). Such superabsorbent laminates are disclosed in U.S. Patent 4,467,012, entitled "Composition For Absorbent Film And Method Of Preparation", which patent issued to Pedersen et al. on August 21, 1984, 4,260,443, entitled "Laminated Absorbent Process", which patent issued to Lindsay et al. on April 7, 1981, and which patents are incorporated herein by reference. The WATER-LOCK L-535 has a hydrogel polymer loading of 0.005 grams per square centimeter, however, loadings of 0.001 - 0.009 grams per square centimeter have been found acceptable. The first and second tissue layers 40 and 43 provide containment of the superabsorbent polymer material 37. Improve lateral wic-

king of the absorbed exudates throughout the absorbent core 34 and provide a degree of absorbency. In the case of non-particulate hydrogel-forming polymer gelling agents which can be formed into fibrous sheets, foams or films, the non-particulate gelling agent may comprise from 15% to 100% by weight of the absorbent core 34, more preferably of from 40% to 100%, and most preferably of from 60% to 100%. The basis weight of such non-particulate superabsorbents may be from 0.002 to 0.028 grams per square centimeter, more preferably of from 0.003 to 0.018, and most preferably of from 0.004 to 0.010. Two suitable and commercially available non-particulate absorbent materials for the absorbent core 34 are a double layer acrylic fibrous material available under the tradename Lanseal F from the Choli Company, LTD., of Higashi, Osaka Japan and a carboxymethylcellulose fibrous material available under the tradename Aqualon C from Hercules, Inc. of Wilmington, Delaware.

The total absorbent capacity of the absorbent core 34 should be compatible with the design exudate loading for the intended use of the sanitary napkin 10. Further, the absorbent capacity of the absorbent core 34 may be varied to accommodate wearers ranging in the expected amount of exudate fluid volume. For instance, a different absorbent capacity may be utilized for sanitary napkins intended for daytime use as compared with those intended for nighttime use, or for sanitary napkins intended for use by teenage females as compared with those intended for use by more mature women.

It should be noted that the scope of the present invention is not intended to extend to sanitary napkins which are void of any superabsorbent material and which have a central absorbent member overlayed solely by nonwoven materials, wherein the nonwoven materials have caliper of less than 0.50 millimeters, as determined by the caliper test, as later defined.

Superimposed over the absorbent core 34 and extending 3.0 millimeters beyond the edges 52 and 55 of the absorbent core 34 is the wet-laid tissue 31. The wet-laid tissue 31 is liquid permeable. A satisfactory wet-laid tissue 31 has a basis weight of 15.8 grams per square meter and an air permeability of 30.5 cubic meters per minute per square meter at a pressure differential of 12.8 millimeters of water. Preferably, the wet-laid tissue 31 maintains integrity when wetted, in use. The wet-laid tissue 31 preferably has a wet tensile strength in the cross-direction of at least 15.0 grams per centimeter. Suitable tissues 31 and their manufacture are disclosed in U.S. Patent 3,301,746, entitled "Process For Forming Absorbent Paper By Imprinting A Fabric Knuckle Pattern Thereon Prior To

Drying And Paper Thereof", which patent issued to Sanford and Sisson on January 31, 1967. In a preferred embodiment, those parts of the wet-laid tissue 31 which extend beyond the edges 52 and 55 of the absorbent core 34 are associated with the barrier sheet 16. The wet-laid tissue 31 may be associated with the barrier sheet 16 by attachment means as are well known in the art such as by spray-gluing or lines or spots of adhesive. The wet-laid tissue 16 serves a number of purposes. The tissue 31 serves to confine any loose superabsorbent material 37 between the tissue 31 and the barrier sheet 16 thereby preventing the superabsorbent material 37 from coming in contact with the wearer's skin. Also, the tissue 31 improves lateral wicking of the absorbed exudates over the absorbent core 34 thereby providing a more even distribution of the exudates throughout the absorbent core 34. Further, the tissue 31 provides some degree of absorbency and further inhibits exudates which have reached and been absorbed by the absorbent core 34 from rewetting the wearer's skin.

Superimposed over the wet-laid tissue 31 is a liquid permeable wipe acquisition sheet 28. In a preferred embodiment, the wipe acquisition sheet 28 is a nonwoven sheet. In the preferred embodiment shown in Figure 2, the sheet 28 is a spun-laced 70%/30% rayon/polyester fiber sheet. Spun-laced fabrics of this type are manufactured by E.I. DuPont Nemours & Company of Wilmington, Delaware, and are made available under the tradename "SONTARA" (SONTARA registered TN by E.I. DuPont Nemours & Company). These fabrics are available in a number of suitable styles, however, Style 8407 in its apertured form, having a basis weight of 0.005 grams per square centimeter and a thickness of 0.04 millimeters, is preferred. The wipe acquisition sheet 28 extends beyond the edges of the wet-laid tissue 31 where it too is associated with the barrier sheet 16. The wipe acquisition sheet 28 greatly improves lateral wicking of exudates over the absorbent core 34 thereby providing a more even distribution of the exudates throughout the absorbent core 34. The lateral wicking of the wipe acquisition sheet 28 is important for the following reason. Many bulky prior art sanitary napkins rely on a high degree of vertical absorption at the point where exudates are initially deposited. In other words, because the absorbent cores of these napkins are fairly thick, they can absorb a high degree of exudates throughout their thickness while utilizing only a small degree of their surface area or lateral absorption capability. However, the relatively thin napkins 10 of the present invention have a comparatively small degree of vertical absorption. Therefore, for a relatively large amount of exudates to be absorbed, a wipe acquisition sheet 28 which can laterally dis-

perse the exudates over a large surface area of the absorbent core 34 where the exudates can better and faster be vertically absorbed is highly desirable. Further, the wipe acquisition sheet 28 provides a fairly high degree of initial absorption during the time interval between the time exudates are deposited onto the topsheet 25 and the time they are absorbed by the absorbent core 34. This property will be more specifically described later.

Superimposed over the wipe acquisition sheet 28 is the liquid permeable topsheet 25. In a preferred embodiment, the topsheet 25 is associated with the wipe acquisition sheet 28 by spray-gluing the topsheet 25 to the surface of the wipe acquisition sheet 28. The topsheet 25 is compliant, soft feeling, and non-irritating to the wearer's skin. Further, the topsheet 25 is liquid pervious, permitting liquid to readily transfer through its thickness. A suitable topsheet 25 may be manufactured from a wide range of materials such as polymeric materials, formed thermoplastic films, apertured plastic films, porous foams, reticulated foams, natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of natural and synthetic fibers, with apertured formed films being preferred. Formed films are preferred for the topsheet 25 because they are pervious to liquids and yet non-absorbent. Thus, the surface of the formed film which is in contact with the body remains dry, thereby reducing body soiling and creating a more comfortable feel for the wearer. Suitable formed films are described in U.S. Patent 3,929,135, entitled "Absorptive Structure Having Tapered-Capillaries", which patent issued to Thompson on December 30, 1975, U.S. Patent 4,324,246, entitled "Disposable Absorbent Article Having A Stain Resistant Topsheet", which patent issued to Mullane and Smith on April 13, 1982, U.S. Patent 4,342,314, entitled "Resilient Plastic Web Exhibiting Fiber-Like Properties", which patent issued to Radel and Thompson on August 3, 1982, and U.S. Patent 4,463,045, entitled "Macroscopically Expanded Three-Dimensional Plastic Web Exhibiting Non-Glossy Visible Surface and Cloth-Like Tactile Impression", which patent issued to Ahr, Louis, Mullane, and Ouellete on July 31, 1984.

In a preferred embodiment of the present invention, the body surface 26 of the topsheet 25 is hydrophilic. The hydrophilic body surface 26 helps liquid to transfer through the topsheet 25 faster than if the body surface 26 was not hydrophilic. This diminishes the likelihood that menstrual fluid will flow off the topsheet 25 rather than being absorbed by the absorbent core 34. In a preferred embodiment, the body surface 26 of the topsheet 25 is made hydrophilic by treating the body surface 26 with a surfactant. It is preferred that the

surfactant be substantially evenly and completely distributed throughout the body surface 26 of the topsheet 25. This can be accomplished by any of the common techniques well known to those skilled in the art. For example, the surfactant can be applied to the topsheet 25 by spraying, by padding, or by the use of transfer rolls. Further, the surfactant can be incorporated into the polymeric materials of a formed film topsheet or between or within the fibers of a nonwoven topsheet.

The barrier means 16 is adjacent the second major surface 22 of the absorbent means 13. In a preferred embodiment, the absorbent means 13 may be affixed over the second major surface 22 of the absorbent means 13 to the barrier means 16. Any of the common techniques well known in the art, such as spray-gluing or lines or spots of adhesive may be used for this purpose. The barrier means 16 generally defines the garment surface 17 of the sanitary napkin 10. The barrier means 16 may be any means which is impervious to liquids and which prevents exudates absorbed and contained in the absorbent means 13 from soiling articles, such as panties, which come in contact with the garment surface 17 of the sanitary napkin 10. In the preferred embodiment of the sanitary napkin 10 illustrated in Figures 1 and 2, the barrier means 16 is a barrier sheet manufactured from a thin plastic film. Other flexible liquid impervious materials may also be used. Preferably, the barrier sheet 16 is a polyethylene film having a thickness of from 0.012 millimeter to about 0.051 millimeter. As used herein, the term "flexible" refers to materials which are compliant and which will readily conform to the general shape and contours of the human body.

A suitable polyethylene film is manufactured by Monsanto Chemical Corporation and marketed in the trade as Film No. 8020. The barrier sheet 16 is preferably embossed and/or matte finished to provide a more clothlike appearance. Further, the barrier sheet 16 may permit vapors to escape from the absorbent means 13 while still preventing exudates from passing through the barrier sheet 16.

Preferably, the topsheet 25 and the barrier sheet 16 have length and width dimensions generally larger than the absorbent core 34 so that they extend beyond the edges 52 and 55 of the absorbent core 34 where they are associated together in a suitable manner. As used herein, the term "associated" encompasses configurations whereby a first member is directly joined to a second member and configurations whereby a first member is indirectly joined to a second member by affixing the first member to intermediate members which in turn are affixed to the second member. The extension of the topsheet 25 and/or the barrier sheet 16 beyond the core end edges 52

and the core side edges 55 of the absorbent core 34 form the end edges 11 and the side edges 12, respectively, of the sanitary napkin 10. In a preferred embodiment, the barrier sheet 16 and the topsheet 25 have an elliptical shape and extend beyond the absorbent core 34 a distance of at least 1.0 centimeter where they are joined directly to each other by attachment means as are well known in the art. The attachment means may be, for example, a uniform continuous layer of adhesive a patterned layer of adhesive, or an array of separate lines or spots of adhesives.

The sanitary napkin 10 of the present invention has a low flexure-resistance. Thus, the sanitary napkin 10 of the present invention is highly flexible and conforms very well to the various shapes of the female urogenital region. Preferably, the sanitary napkin 10 of the present invention has a flexure-resistance of less than 300.0 grams, more preferably less than 250.0 grams, and still more preferably less than about 175.0 grams and most preferably less than 130.0 grams.

The flexure-resistance of a sanitary napkin is measured by peak bending stiffness. Peak bending stiffness is determined by a test which is modeled after the ASTM D 4032-82 CIRCULAR BEND PROCEDURE, the procedure being considerably modified and performed as follows. The CIRCULAR BEND PROCEDURE is a simultaneous multi-directional deformation of a material in which one face of a specimen becomes concave and the other face becomes convex. The CIRCULAR BEND PROCEDURE gives a force value related to flexure-resistance, simultaneously averaging stiffness in all directions.

APPARATUS:

The apparatus necessary for the CIRCULAR BEND PROCEDURE is a modified Circular Bend Stiffness Tester, having the following parts:

A smooth-polished steel plate platform which is 102.0 x 102.0 x 6.35 millimeters having an 18.75 millimeter diameter orifice. The lap edge of the orifice should be at a 45 degree angle to a depth of 4.75 millimeters.

A plunger having an overall length of 72.2 millimeters, a diameter of 6.25 millimeters, a ball nose having a radius of 2.97 millimeters and a needle-point extending 0.88 millimeter therefrom having a 0.33 millimeter base diameter and a point having a radius of less than 0.5 millimeter, the plunger being mounted concentric with the orifice and having equal clearance on all sides. Note that the needle-point is merely to prevent lateral movement of the test specimen during testing. Therefore, if the needle-point significantly adversely affects the test

specimen (for example, punctures an inflatable structure), than the needle-point should not be used. The bottom of the plunger should be set well above the top of the orifice plate. From this position, the downward stroke of the ball nose is to the exact bottom of the plate orifice.

5 A force-measurement gauge and more specifically an Instron inverted compression load cell. The load cell has a load range of from 0.0 to 2000.0 grams. 10 An actuator, and more specifically the Instron Model No. 1122 having an inverted compression load cell. The Instron 1122 is made by the Instron Engineering Corporation, Canton, Massachusetts.

15 NUMBER AND PREPARATION OF SPECIMENS

In order to perform the procedure for this test, as explained below, five representative sanitary napkins are necessary. From one of the five napkins to be tested, some number "Y" of 37.5 x 37.5 millimeter test specimens are cut. Specimens having portions in which a topsheet is joined directly to a barrier sheet or which are a laminate of a topsheet, two or less tissue sheets and a barrier sheet, should not be tested. The reason that these specimens are not tested is due to the realization that prior art napkins exist in which a topsheet is joined to a barrier sheet beyond the edges of an absorbent core in the periphery of the napkin, such portions of which are highly flexible. However, the present invention is more concerned with the overall flexibility of the sanitary napkin and not merely the peripheral portions thereof and, therefore, the flexibility of the present invention is more concerned with the flexibility of the significant absorbent portions of the sanitary napkin. If any of these significant absorbent portions of the sanitary napkin meet the parameters of this test, then the sanitary napkin satisfies the test. Therefore, a number of different specimens should be tested from each sanitary napkin. Certainly, the structurally most flexible portion of the sanitary napkin should be tested, excluding those portions excluded above. 45 The test specimens should not be folded or bent by the test person, and the handling of specimens must be kept to a minimum and to the edges to avoid affecting flexural-resistance properties. From the four remaining sanitary napkins, an equal number "Y" of 37.5 x 37.5 millimeter specimens, identical to the specimens cut from the first napkin, are cut. Thus, the test person should have "Y" number of sets of five identical specimens.

55 PROCEDURE

The procedure for the CIRCULAR BEND PRO-

CEDURE is as follows. The specimens are conditioned by leaving them in a room which is $21 \pm 1^\circ\text{C}$ and $50 \pm 2\%$ relative humidity for a period of two hours. The test plate is leveled. The plunger speed is set at 50.0 centimeters per minute per full stroke length. A specimen is centered on the orifice platform below the plunger such that the body surface 26 of the specimen is facing the plunger and the garment surface 17 of the specimen is facing the platform. The indicator zero is checked and adjusted, if necessary. The plunger is actuated. Touching the specimen during the testing should be avoided. The maximum force reading to the nearest gram is recorded. The above steps are repeated until all five of the identical specimens have been tested.

CALCULATIONS

The peak bending stiffness for each specimen is the maximum force reading for that specimen. Remember that "Y" number of sets of five identical specimens were cut. Each set of five identical specimens is tested and the five values received for that set are averaged. Thus, the test person now has an average value for each of the "Y" sets tested. Remember, if any of the significantly absorbent portions of the sanitary napkin have the requisite flexure-resistance, then the napkin satisfies the parameters of this test. Therefore, the flexure-resistance for a particularly designed sanitary napkin is the greatest of these average peak bending stiffnesses.

As alluded to earlier, the combination of topsheet 25 and wipe acquisition sheet 28 imparts some beneficial properties to the sanitary napkin 10. In particular, the combination of an apertured formed film topsheet 25 superimposed over an apertured nonwoven wipe acquisition sheet 28 is beneficial. A preferred wipe acquisition sheet 28 is the previously described SONTARA 8407. An enlarged depiction of such an arrangement is shown in Figure 3. Such a combination is even more beneficial when the nonwoven wipe acquisition sheet 28 is formed or positioned such that no fiber bundles 89 of the sheet 28 are beneath some of the apertures 83 of the formed film topsheet 25 (i.e., the apertures in the two sheets 25 and 28 are aligned) while beneath other apertures 83 of the formed film topsheet 25 fiber bundles 89 of the nonwoven sheet 28 are present (i.e., apertures in the two sheets 25 and 28 are not aligned). Such an arrangement is readily apparent in Figure 3, wherein the apertures 86 of the nonwoven sheet 28 are larger than the apertures 83 of the formed film topsheet 25. Such an arrangement provides the sanitary napkin 10 at least two beneficial prop-

erties: enhanced gush acquisition and enhanced wipe acquisition. Gush acquisition is enhanced in those areas where the apertures 83 of the topsheet 25 are aligned with the apertures 86 of the nonwoven wipe acquisition sheet 28. The aligned apertures 83 and 86 provide a direct route for exudates to flow from the body surface 26 of the topsheet 25 to the central absorbent materials of the napkin 10. Further, the apertures 83 and 86 themselves are able to contain a degree of fluid within their walls or boundaries until such fluid is absorbed. Wipe acquisition, which is the ability to pull liquid exudates from the wearer's skin into the absorbent material of the napkin 10, is enhanced in those areas where fiber bundles 89 of the nonwoven wipe acquisition sheet 28 are aligned such that the fiber bundles 89 are beneath the openings of the apertures 83 of the topsheet 25.

As just mentioned, wipe acquisition is critical in those regions where the topsheet 25 is in contact with exudates on the wearer's skin. In such areas, the sanitary napkin 10 is likely under compressive forces from the wearer's body. When such is the case, the fiber bundles 89 of the nonwoven wipe acquisition sheet 28 beneath the apertures 83 of the topsheet 25 are forced somewhat up into the apertures 83 of the topsheet 25, closer to the wearer's skin. Obviously, the spaces between the fiber bundles 89 and the walls of the apertures 83 or between the fibers of the fiber bundles 89 themselves will be less than the spaces which were between only the walls of the apertures 83. These spaces are capillaries. As is well known in the art, as capillary spaces are decreased, capillary or drawing action is increased. Thus, the capillary action in these apertures 83 where fiber bundles 89 are present is increased and the sanitary napkin 10 is better able to draw exudates from the wearer's skin into these capillaries and eventually into the central absorbent materials of the sanitary napkin 10.

Although all of the apertures 83 of the topsheet 25 are referenced by the numeral "83", for the following teaching purposes; specific reference is directed to the aperture of Figure 3 specifically labeled and designated "83". The specific aperture 83 referenced is an example in which an aperture 83 of the topsheet 25 is aligned with an aperture 86 of the nonwoven wipe acquisition sheet 28. Theoretically, such an aperture is useful for gush acquisition since exudates have uninterrupted flow from the body surface 26 of the topsheet 25 to the central absorbent material (not shown). Next, attention is directed to the aperture 83 immediately to the right of the specific aperture 83 just referenced. As seen, this aperture 83 is superimposed over a fiber bundle 89 of the nonwoven wipe acquisition sheet 28. Theoretically, exudates that flow into the

aperture 83 will enter the capillaries of the fiber bundle 89. The exudates will then either be pulled or absorbed into the central absorbent materials or wicked to intersecting fiber bundles 89, then wicked further to other intersecting fiber bundles 89, and so on, until the exudates are absorbed into a more laterally distant portion of the central absorbent materials. Hence, a large portion of the total absorbent capacity of the absorbent materials can be utilized.

As previously mentioned, the sanitary napkin 10 of the present invention has a liquid capacity great enough to absorb medium to high menstrual flows. Two capacities, which, depending on the size of the sanitary napkin may be the same, are determinable: test capacity and total capacity. The napkin 10 of the present invention has a test capacity of at least 8.0 grams, more preferably of at least 15.0 grams, and most preferably of at least 18.0 grams. The napkin 10 of the present invention has a total capacity of at least 14.0 grams, preferably of at least 20.0 grams, more preferably of at least 30.0 grams, and most preferably of at least 40.0 grams.

The test and total capacities of a sanitary napkin are determined as follows. Any panty adhesive release paper is removed from the napkin to be tested. To determine test capacity, a 4.75 x 14.0 centimeters portion, or any other configuration having 66.5 square centimeters, of the sanitary napkin is cut from the portion of the sanitary napkin which would be centered under the vaginal orifice when the sanitary napkin is worn. Total capacity is determined using the entire napkin minus any release paper. The article is weighed to the nearest 0.1 gram. The article is then submerged in a beaker of sterile saline (obtainable from the Baxter Travenol Company of Deerfield, Illinois), such that the article is totally submerged and is not bent or otherwise twisted or folded. The article is submerged for 10 minutes. The article is removed from the saline and suspended for two minutes in a vertical position to allow the saline to drain out of the article. The article is then placed body facing surface down onto an absorbent blotter, such as the filter paper #631 available from the Filtration Science Corp., Eaton-Dikeman Division of Mount Holly Springs, Pennsylvania. A uniform 17.6 grams per square centimeter load is placed over the article to squeeze excess fluid out. The absorbent blotter is replaced every 30 seconds until the amount of fluid transferred to the absorbent blotter is less than 0.5 grams in a 30 second period. Next, the article is weighed to the nearest 0.1 gram and the dry weight of the article is subtracted. The difference in grams is the test or total capacity of the article, whichever the case may be.

The central absorbent width 63 of absorbent

material of the sanitary napkin 10 of the present invention is an important parameter. The term "central absorbent width" refers to a specific area of the sanitary napkin 10 determinable as follows, reference being had to Figure 5. A point 64 on the sanitary napkin 10 which is disposed beneath the center of the vaginal orifice, when worn, is located. A plane 65 parallel to the lateral centerline 61 and 3.75 centimeters forward from the point 64 in the direction of the wearer's mons pubis is located. Another plane 66 parallel to the lateral centerline 61 and 5.0 centimeters rearward from the point 64 in the direction of the wearer's buttocks is also located. The greatest flat-out, uncompressed, unmanipulated, lateral width of absorbent material of the sanitary napkin 10 between the planes 65 and 66 is the central absorbent width 63 of the sanitary napkin 10. It matters not whether the absorbent material is a single sheet, overlapping sheets, staggered sheets, etc., and it matters not whether the absorbent material is a nonwoven sheet, an absorbent topsheet, an absorbent core, a tissue, synthetic staple fibers, etc. For example, a sanitary napkin 10 of the present invention might have a wipe acquisition sheet 28 or a wet-laid tissue 31 having a width of about 7.75 centimeters and an absorbent core 34 having a width of 3.8 centimeters. Thus, in this example, the sanitary napkin 10 has a central absorbent width 63 of 7.75 centimeters.

The sanitary napkin 10 should preferably be scaled to the width of the crotch of the underwear of the wearer; A sanitary napkin 10 having a central absorbent width 63 which registers the absorbent 13 with the edges of the underwear crotch is particularly preferred. For relatively narrower underwear crotches, having a width of 3.7 to 6.4 centimeters, a sanitary napkin having a central absorbent width 63 of 3.7 to 6.4 centimeters works well.

The total width of the napkin 10 is scaled to the central absorbent width 63, and should be from 0.6 to 1.0 centimeters greater than the central absorbent width 63, due to the additional margin necessary to join the edges of the topsheet 25 and barrier sheet 16 together. Generally 0.3 to 0.5 centimeters are necessary at each edge of the napkin 10 to join the topsheet 25 to the barrier sheet 16. Thus, a napkin having a central absorbent width 63 of 3.7 to 6.4 centimeters will have a total width ranging from 4.3 to 4.7 centimeters to from 7.0 to 7.4 centimeters.

The sanitary napkin 10 of one embodiment of the present invention intended for underwear having a relatively greater crotch width should have a central absorbent width 63 of at least 6.5 centimeters, more preferably of at least 7.0 centimeters, more preferably of at least 7.75 centimeters, and most preferably of at least 9.0 centimeters.

As the central absorbent width 63 of the sanitary napkin 10 diminishes, the total capacity, as determined by the aforementioned Test Procedure, will proportionally diminish, unless the sanitary napkin 10 is lengthened in the longitudinal direction. Because a pad which is excessively lengthened may not be comfortable to wear, it is acceptable, for a pad having a central absorbent width 63 of 6.2 centimeters or less to have a reduced total capacity. For such an arrangement a sanitary napkin 10 having a total capacity of 14 grams has been found to work well.

The central absorbent width 63 of the sanitary napkin 10 of the present invention is believed important for the following reason. As stated previously, the sanitary napkin 10 of the present invention relies more on the lateral distribution of exudates over or through a relatively large surface area of the absorbent core 34 rather than on a high degree of vertical absorption common to many prior art sanitary napkins. Therefore, because exudates which are distributed onto the topsheet 25 may not be quickly absorbed before they migrate across the topsheet 25, it is important to contain such exudates pending absorption. The specified central absorbent width 63 of the sanitary napkin 10 of the present invention has been determined based on the width of a flexible napkin which will cup around the labia in the region of the vaginal orifice such that at least the edges of the absorbent material are positioned in the uppermost part of the wearer's legs at the crotch. Thus, the sanitary napkin 10 and the absorbent material may be cupped shaped in the surrounding regions of the vaginal orifice and exudates deposited thereon will be contained until absorbed.

Because of the flexibility requirements of the sanitary napkins 10 of the present invention, it is likely that the sanitary napkins 10 of the present invention will be relatively thin. It is preferred to keep the sanitary napkins 10 of the present invention thin so that the sanitary napkins 10 of the present invention will be unobtrusive and the user will have a low awareness of the sanitary napkin 10 of the present invention while it is being worn. The sanitary napkin 10 shown in Figures 1 and 2 has a caliper of 1.9 millimeters. The caliper of a sanitary napkin 10 is determined by the following test.

A comparator gauge, and specifically the Ames, Model 130 with dial indicator Model 482, available from the B.C. Ames, Company of Waltham, Massachusetts is needed. The comparator gauge should have a circular comparator foot made of aluminum and having a weight of 10.0 grams and a contact surface of 5.16 square centimeters. The comparator gauge is zeroed. An 80.0 grams stainless steel weight is placed on the spindle extending above the comparator dial. The com-

parator foot is raised and the napkin, with any panty adhesive release paper being removed, is placed garment surface down on the base plate. The napkin is positioned on the base plate so that 5 when the foot is lowered it is in the center of the napkin. Try to smooth out or avoid any wrinkles in the napkin. Gently lower the foot onto the napkin. Determine the napkin caliper by reading the comparator dial 30 seconds after the foot comes in 10 contact with the napkin. Repeat the measurement 3.0 centimeters from each of the ends of the absorbent material along the longitudinal centerline 58 of the napkin. The average of the three readings is 15 the caliper of the sanitary napkin. Preferably, the sanitary napkins 10 of the present invention have a caliper of less than 2.6 millimeters, more preferably less than 2.2 millimeters, and most preferably less than 2.0 millimeters. The caliper of the sanitary napkin of the present invention may be increased, 20 in a less preferred embodiment, proportional to an increase in the flexure-resistance. If the flexure-resistance is increased to greater than 400 grams, or even greater than about 500 grams, the caliper may be increased to as much as 4.0 to about 5.0 25 millimeters, but preferably is not greater than 3.0 millimeters.

An alternative embodiment of a sanitary napkin 10 of the present invention is shown in Figure 4. In this embodiment, the sanitary napkin 10 has two 30 flaps 70 each of which are adjacent to and extend laterally from a side edge 55 of the absorbent core 34. The flaps 70 are configured to drape over the edges of the wearer's panties in the crotch region so that the flaps 70 are disposed between the 35 edges of the wearer's panties and the wearer's thighs. The flaps 70 serve at least two purposes. First, the flaps 70 help serve to prevent soiling of the wearer's body and panties by menstrual fluid. Second, the flaps 70 are preferably provided with 40 attachment means 71 on their garment surface 17 so that the flaps 70 can be folded back under the panty and attached to the garment facing side of the panty. In this way, the flaps 70 serve to keep the napkin 10 properly positioned in the panty. A 45 preferred attachment means 71 is a pressure-sensitive adhesive, as is well known in the art. Alternatively, the flaps 70 may be attached to each other on the underside of the panty by the attachment means 71 without being affixed to the panty.

In the preferred embodiment shown, the flaps 50 70 are comprised of topsheet 25, tissue 31, and barrier sheet 16. Further, in the embodiment shown, the flaps 70 are unitary with the laminae of the napkin 10. In other words, the topsheet 25, 55 tissue 31 and barrier sheet 16 simply extend laterally beyond the core 34 to form the flaps 70. However, the flaps 70 need not be unitary with the napkin 10 but can be separate elements which are

affixed to the napkin 10. Further, the flaps 70 can be comprised of a single substrate or other laminae configurations. It is recommended, however, that the flaps 70 have a liquid impervious barrier sheet 16. The barrier sheet 16 prevents exudates which reach the flaps 70 from soiling the edges of the wearer's panties. Further, it is preferable that the flaps 70 be provided with an absorbent layer, at least to a point beyond the edges of the wearer's panties. Theoretically, only a relatively small amount of menses should reach the flaps 70, therefore, only a relatively small amount of absorbent material is desirable in the flaps 70. However, at least some absorbent material is recommended in order to prevent any exudates that reach the flaps 70 from being able to flow further to unprotected areas. The absorbent material may be a tissue, such as the tissue 31, or an extension of the absorbent core 34, such as the WATER-LOCK L - 535. However, the absorbent material in the flaps 70 should be relatively highly flexible. A number of sanitary napkins having flaps suitable or adaptable for use with the sanitary napkins 10 of the present invention are known. Such flaps are disclosed in U.S. Patent 4,687,478, entitled "Shaped Sanitary Napkin With Flaps", which patent issued to Van Tilburg on August 18, 1987, U.S. Patent 4,608,047, entitled "Sanitary Napkin Attachment Means", which patent issued to Mattingly on August 26, 1986, U.S. Patent 4,589,876, entitled "Sanitary Napkin", which patent issued to Van Tilburg on May 20, 1986, and U.S. Patent 4,285,343, entitled "Sanitary Napkin", which patent issued to McNair on August 25, 1981.

For illustration purposes, the central absorbent width 63 of the napkin 10 shown in Figure 4 would extend laterally from the outer edge 32 of the tissue 31 in the one flap 70 to the outer edge 32 of the tissue 31 in the other flap 70.

Another alternative embodiment of a sanitary napkin 10 of the present invention is shown in Figure 5. Like the napkin 10 shown in Figure 4, this napkin 10 also has flaps 70, only of a different configuration. In this embodiment, the flaps 70 are comprised only of the topsheet 25 and the barrier sheet 55.

For illustration purposes, the central absorbent width 63 of the napkin 10 shown in Figure 5 would extend laterally from one outer edge 32 of the tissue 31 to the other outer edge 32 of the tissue 31.

Claims

1. A sanitary napkin having a body surface and a garment surface, comprising:
an absorbent means having a first major surface

and a second major surface; and
a liquid impermeable barrier means forming said garment surface and disposed adjacent said second major surface of said absorbent means,
characterised in that said sanitary napkin has a caliper of less than 5.0 millimeters, a flexure-resistance of less than 400 grams, a test capacity of at least 8.0 grams, and a total capacity of at least 14.0 grams.

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 1235 1240 1245 1250 1255 1260 1265 1270 1275 1280 1285 1290 1295 1300 1305 1310 1315 1320 1325 1330 1335 1340 1345 1350 1355 1360 1365 1370 1375 1380 1385 1390 1395 1400 1405 1410 1415 1420 1425 1430 1435 1440 1445 1450 1455 1460 1465 1470 1475 1480 1485 1490 1495 1500 1505 1510 1515 1520 1525 1530 1535 1540 1545 1550 1555 1560 1565 1570 1575 1580 1585 1590 1595 1600 1605 1610 1615 1620 1625 1630 1635 1640 1645 1650 1655 1660 1665 1670 1675 1680 1685 1690 1695 1700 1705 1710 1715 1720 1725 1730 1735 1740 1745 1750 1755 1760 1765 1770 1775 1780 1785 1790 1795 1800 1805 1810 1815 1820 1825 1830 1835 1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080 2085 2090 2095 2100 2105 2110 2115 2120 2125 2130 2135 2140 2145 2150 2155 2160 2165 2170 2175 2180 2185 2190 2195 2200 2205 2210 2215 2220 2225 2230 2235 2240 2245 2250 2255 2260 2265 2270 2275 2280 2285 2290 2295 2300 2305 2310 2315 2320 2325 2330 2335 2340 2345 2350 2355 2360 2365 2370 2375 2380 2385 2390 2395 2400 2405 2410 2415 2420 2425 2430 2435 2440 2445 2450 2455 2460 2465 2470 2475 2480 2485 2490 2495 2500 2505 2510 2515 2520 2525 2530 2535 2540 2545 2550 2555 2560 2565 2570 2575 2580 2585 2590 2595 2600 2605 2610 2615 2620 2625 2630 2635 2640 2645 2650 2655 2660 2665 2670 2675 2680 2685 2690 2695 2700 2705 2710 2715 2720 2725 2730 2735 2740 2745 2750 2755 2760 2765 2770 2775 2780 2785 2790 2795 2800 2805 2810 2815 2820 2825 2830 2835 2840 2845 2850 2855 2860 2865 2870 2875 2880 2885 2890 2895 2900 2905 2910 2915 2920 2925 2930 2935 2940 2945 2950 2955 2960 2965 2970 2975 2980 2985 2990 2995 3000 3005 3010 3015 3020 3025 3030 3035 3040 3045 3050 3055 3060 3065 3070 3075 3080 3085 3090 3095 3100 3105 3110 3115 3120 3125 3130 3135 3140 3145 3150 3155 3160 3165 3170 3175 3180 3185 3190 3195 3200 3205 3210 3215 3220 3225 3230 3235 3240 3245 3250 3255 3260 3265 3270 3275 3280 3285 3290 3295 3300 3305 3310 3315 3320 3325 3330 3335 3340 3345 3350 3355 3360 3365 3370 3375 3380 3385 3390 3395 3400 3405 3410 3415 3420 3425 3430 3435 3440 3445 3450 3455 3460 3465 3470 3475 3480 3485 3490 3495 3500 3505 3510 3515 3520 3525 3530 3535 3540 3545 3550 3555 3560 3565 3570 3575 3580 3585 3590 3595 3600 3605 3610 3615 3620 3625 3630 3635 3640 3645 3650 3655 3660 3665 3670 3675 3680 3685 3690 3695 3700 3705 3710 3715 3720 3725 3730 3735 3740 3745 3750 3755 3760 3765 3770 3775 3780 3785 3790 3795 3800 3805 3810 3815 3820 3825 3830 3835 3840 3845 3850 3855 3860 3865 3870 3875 3880 3885 3890 3895 3900 3905 3910 3915 3920 3925 3930 3935 3940 3945 3950 3955 3960 3965 3970 3975 3980 3985 3990 3995 4000 4005 4010 4015 4020 4025 4030 4035 4040 4045 4050 4055 4060 4065 4070 4075 4080 4085 4090 4095 4100 4105 4110 4115 4120 4125 4130 4135 4140 4145 4150 4155 4160 4165 4170 4175 4180 4185 4190 4195 4200 4205 4210 4215 4220 4225 4230 4235 4240 4245 4250 4255 4260 4265 4270 4275 4280 4285 4290 4295 4300 4305 4310 4315 4320 4325 4330 4335 4340 4345 4350 4355 4360 4365 4370 4375 4380 4385 4390 4395 4400 4405 4410 4415 4420 4425 4430 4435 4440 4445 4450 4455 4460 4465 4470 4475 4480 4485 4490 4495 4500 4505 4510 4515 4520 4525 4530 4535 4540 4545 4550 4555 4560 4565 4570 4575 4580 4585 4590 4595 4600 4605 4610 4615 4620 4625 4630 4635 4640 4645 4650 4655 4660 4665 4670 4675 4680 4685 4690 4695 4700 4705 4710 4715 4720 4725 4730 4735 4740 4745 4750 4755 4760 4765 4770 4775 4780 4785 4790 4795 4800 4805 4810 4815 4820 4825 4830 4835 4840 4845 4850 4855 4860 4865 4870 4875 4880 4885 4890 4895 4900 4905 4910 4915 4920 4925 4930 4935 4940 4945 4950 4955 4960 4965 4970 4975 4980 4985 4990 4995 5000 5005 5010 5015 5020 5025 5030 5035 5040 5045 5050 5055 5060 5065 5070 5075 5080 5085 5090 5095 5100 5105 5110 5115 5120 5125 5130 5135 5140 5145 5150 5155 5160 5165 5170 5175 5180 5185 5190 5195 5200 5205 5210 5215 5220 5225 5230 5235 5240 5245 5250 5255 5260 5265 5270 5275 5280 5285 5290 5295 5300 5305 5310 5315 5320 5325 5330 5335 5340 5345 5350 5355 5360 5365 5370 5375 5380 5385 5390 5395 5400 5405 5410 5415 5420 5425 5430 5435 5440 5445 5450 5455 5460 5465 5470 5475 5480 5485 5490 5495 5500 5505 5510 5515 5520 5525 5530 5535 5540 5545 5550 5555 5560 5565 5570 5575 5580 5585 5590 5595 5600 5605 5610 5615 5620 5625 5630 5635 5640 5645 5650 5655 5660 5665 5670 5675 5680 5685 5690 5695 5700 5705 5710 5715 5720 5725 5730 5735 5740 5745 5750 5755 5760 5765 5770 5775 5780 5785 5790 5795 5800 5805 5810 5815 5820 5825 5830 5835 5840 5845 5850 5855 5860 5865 5870 5875 5880 5885 5890 5895 5900 5905 5910 5915 5920 5925 5930 5935 5940 5945 5950 5955 5960 5965 5970 5975 5980 5985 5990 5995 6000 6005 6010 6015 6020 6025 6030 6035 6040 6045 6050 6055 6060 6065 6070 6075 6080 6085 6090 6095 6100 6105 6110 6115 6120 6125 6130 6135 6140 6145 6150 6155 6160 6165 6170 6175 6180 6185 6190 6195 6200 6205 6210 6215 6220 6225 6230 6235 6240 6245 6250 6255 6260 6265 6270 6275 6280 6285 6290 6295 6300 6305 6310 6315 6320 6325 6330 6335 6340 6345 6350 6355 6360 6365 6370 6375 6380 6385 6390 6395 6400 6405 6410 6415 6420 6425 6430 6435 6440 6445 6450 6455 6460 6465 6470 6475 6480 6485 6490 6495 6500 6505 6510 6515 6520 6525 6530 6535 6540 6545 6550 6555 6560 6565 6570 6575 6580 6585 6590 6595 6600 6605 6610 6615 6620 6625 6630 6635 6640 6645 6650 6655 6660 6665 6670 6675 6680 6685 6690 6695 6700 6705 6710 6715 6720 6725 6730 6735 6740 6745 6750 6755 6760 6765 6770 6775 6780 6785 6790 6795 6800 6805 6810 6815 6820 6825 6830 6835 6840 6845 6850 6855 6860 6865 6870 6875 6880 6885 6890 6895 6900 6905 6910 6915 6920 6925 6930 6935 6940 6945 6950 6955 6960 6965 6970 6975 6980 6985 6990 6995 7000 7005 7010 7015 7020 7025 7030 7035 7040 7045 7050 7055 7060 7065 7070 7075 7080 7085 7090 7095 7100 7105 7110 7115 7120 7125 7130 7135 7140 7145 7150 7155 7160 7165 7170 7175 7180 7185 7190 7195 7200 7205 7210 7215 7220 7225 7230 7235 7240 7245 7250 7255 7260 7265 7270 7275 7280 7285 7290 7295 7300 7305 7310 7315 7320 7325 7330 7335 7340 7345 7350 7355 7360 7365 7370 7375 7380 7385 7390 7395 7400 7405 7410 7415 7420 7425 7430 7435 7440 7445 7450 7455 7460 7465 7470 7475 7480 7485 7490 7495 7500 7505 7510 7515 7520 7525 7530 7535 7540 7545 7550 7555 7560 7565 7570 7575 7580 7585 7590 7595 7600 7605 7610 7615 7620 7625 7630 7635 7640 7645 7650 7655 7660 7665 7670 7675 7680 7685 7690 7695 7700 7705 7710 7715 7720 7725 7730 7735 7740 7745 7750 7755 7760 7765 7770 7775 7780 7785 7790 7795 7800 7805 7810 7815 7820 7825 7830 7835 7840 7845 7850 7855 7860 7865 7870 7875 7880 7885 7890 7895 7900 7905 7910 7915 7920 7925 7930 7935 7940 7945 7950 7955 7960 7965 7970 7975 7980 7985 7990 7995 8000 8005 8010 8015 8020 8025 8030 8035 8040 8045 8050 8055 8060 8065 8070 8075 8080 8085 8090 8095 8100 8105 8110 8115 8120 8125 8130 8135 8140 8145 8150 8155 8160 8165 8170 8175 8180 8185 8190 8195 8200 8205 8210 8215 8220 8225 8230 8235 8240 8245 8250 8255 8260 8265 8270 8275 8280 8285 8290 8295 8300 8305 8310 8315 8320 8325 8330 8335 8340 8345 8350 8355 8360 8365 8370 8375 8380 8385 8390 8395 8400 8405 8410 8415 8420 8425 8430 8435 8440 8445 8450 8455 8460 8465 8470 8475 8480 8485 8490 8495 8500 8505 8510 8515 8520 8525 8530 8535 8540 8545 8550 8555 8560 8565 8570 8575 8580 8585 8590 8595 8600 8605 8610 8615 8620 8625 8630 8635 8640 8645 8650 8655 8660 8665 8670 8675 8680 8685 8690 8695 8700 8705 8710 8715 8720 8725 8730 8735 8740 8745 8750 8755 8760 8765 8770 8775 8780 8785 8790 8795 8800 8805 8810 8815 8820 8825 8830 8835 8840 8845 8850 8855 8860 8865 8870 8875 8880 8885 8890 8895 8900 8905 8910 8915 8920 8925 8930 8935 8940 8945 8950 8955 8960 8965 8970 8975 8980 8985 8990 8995 9000 9005 9010 9015 9020 9025 9030 9035 9040 9045 9050 9055 9060 9065 9070 9075 9080 9085 9090 9095 9100 9105 9110 9115 9120 9125 9130 9135 9140 9145 9150 9155 9160 9165 9170 9175 9180 9185 9190 9195 9200 9205 9210 9215 9220 9225 9230 9235 9240 9245 9250 9255 9260 9265 9270 9275 9280 9285 9290 9295 9300 9305 9310 9315 9320 9325 9330 9335 9340 9345 9350 9355 9360 9365 9370 9375 9380 9385 9390 9395 9400 9405 9410 9415 9420 9425 9430 9435 9440 9445 9450 9455 9460 9465 9470 9475 9480 9485 9490 9495 9500 9505 9510 9515 9520 9525 9530 9535 9540 9545 9550 9555 9560 9565 9570 9575 9580 9585 9590 9595 9600 9605 9610 9615 9620 9625 9630 9635 9640 9645 9650 9655 9660 9665 9670 9675 9680 9685 9690 9695 9700 9705 9710 9715 9720 9725 9730 9735 9740 9745 9750 9755 9760 9765 9770 9775 9780 9785 9790 9795 9800 9805 9810 9815 9820 9825 9830 9835 9840 9845 9850 9855 9860 9865 9870 9875 9880 9885 9890 9895 9900 9905 9910 9915 9920 9925 9930 9935 9940 9945 9950 9955 9960 9965 9970 9975 9980 9985 9990 9995 10000 10005 10010 10015 10020 10025 10030 10035 10040 10045 10050 10055 10060 10065 10070 10075 10080 10085 10090 10095 10100 10105 10110 10115 10120 10125 10130 10135 10140 10145 10150 10155 10160 10165 10170 10175 10180 10185 10190 10195 10200 10205 10210 10215 10220 10225 10230 10235 10240 10245 10250 10255 10260 10265 10270 10275 10280 10285 10290 10295 10300 10305 10310 10315 10320 10325 10330 10335 10340 10345 10350 10355 10360 10365 1037

Fig. 1

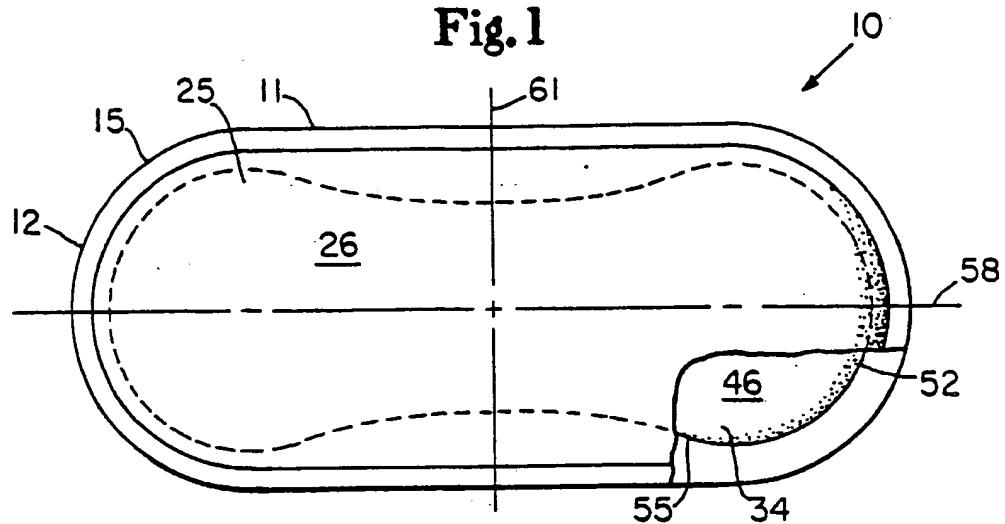


Fig. 2

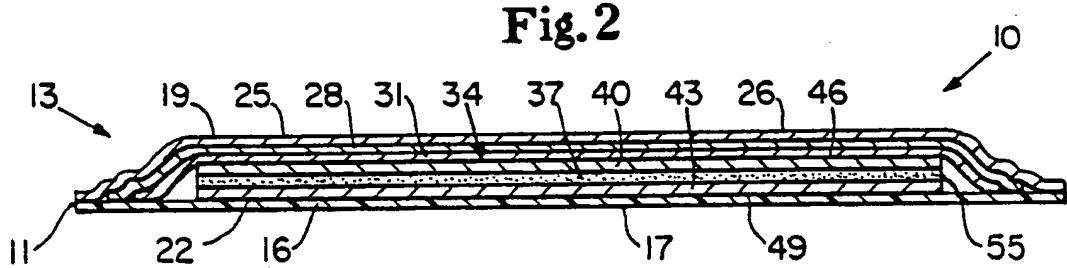


Fig. 3

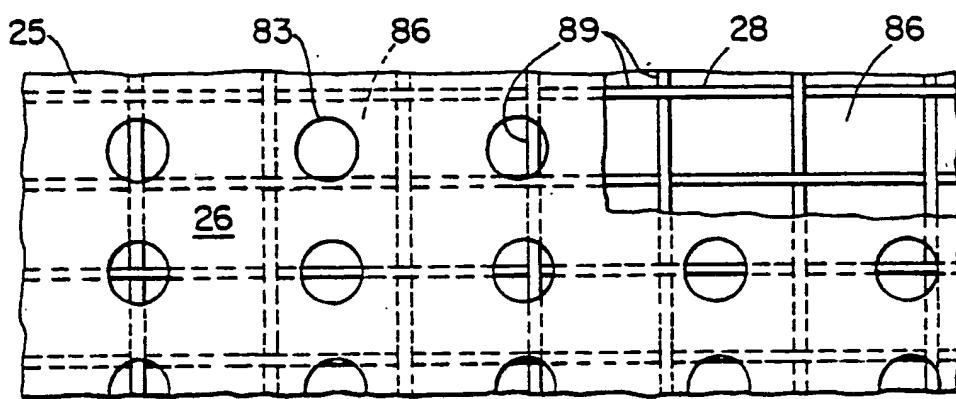


Fig. 4

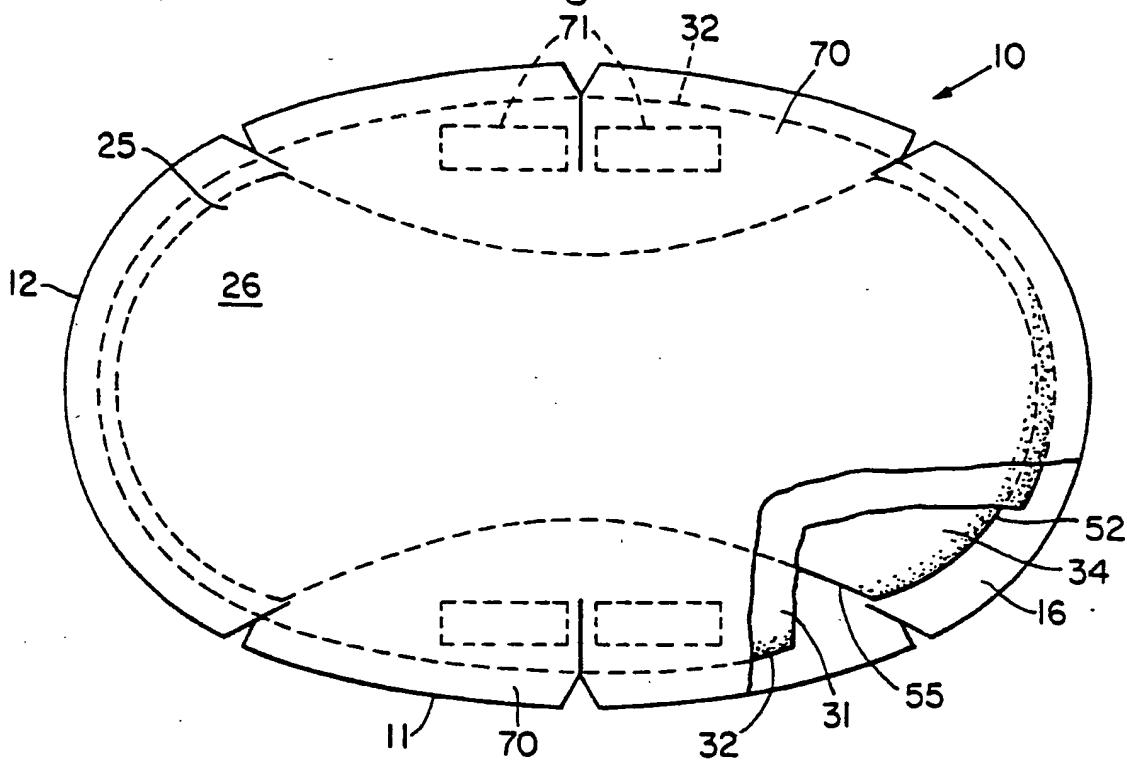
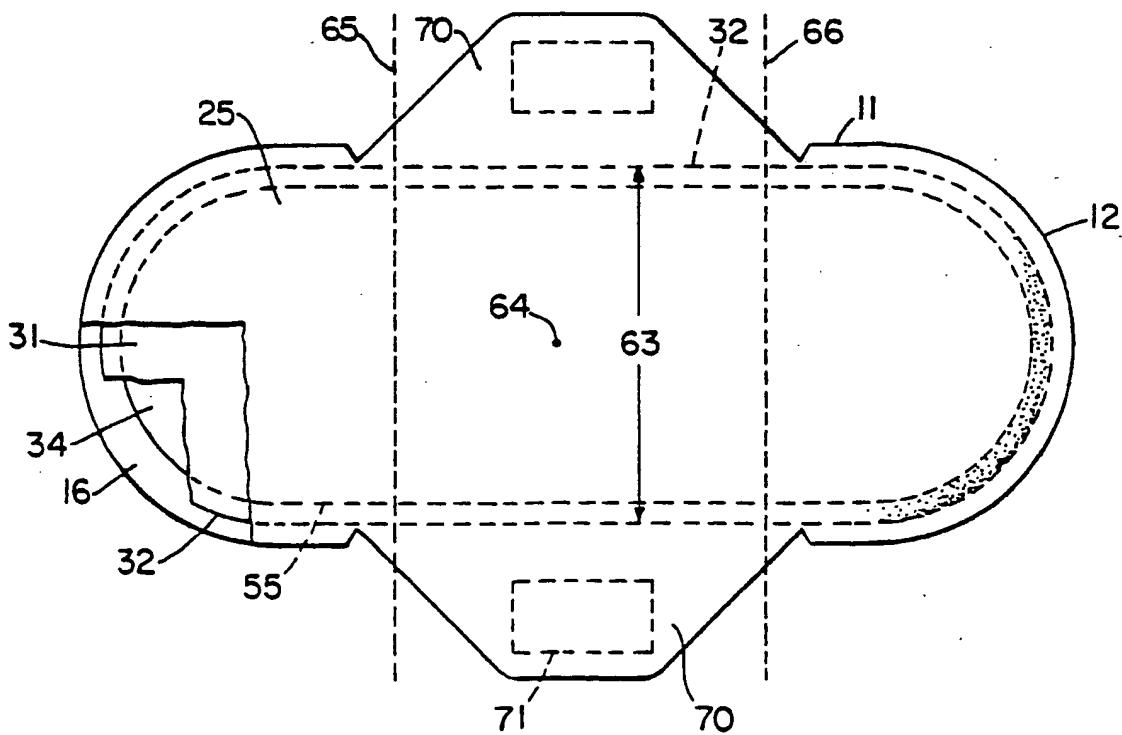


Fig. 5





EP 89302553.6

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US - A - 4 425 130 (DES MARAIS) * Claims * --	1,3,6	A 61 F 13/16
A	US - A - 4 057 061 (ISHIKAWA) * Claims * --	1,3,6	
A	EP - A1 - 0 215 417 (KIMBERLY-CLARK) * Claims * -----	1	
TECHNICAL FIELDS SEARCHED (Int. Cl.4)			
A 61 F A 61 L A 41 B			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
VIENNA	14-06-1989	BECKER	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			